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QUALIFICATION AND CERTIFICATION TESTS CNU-445/E AND CNU-447/E MAVERICK MISSILE CONTAINERS

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Wright-Patterson AFB OH 45433-5999

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ABSTRACT

Aeronautical Systems Division, ASD/TAML, requested assistance from the Air Force Packaging Evaluation Activity to conduct certification and qualification testing on two new aluminum Maverick missile containers.

The CNU-445/E and the CNU-447/E prototype containers were designed and fabricated by AD/YNP, Eglin AFB, FL 32542-5000. The containers are environmentally sealed with a humidity indicator, desiccant port, and a pressure relief valve. Both containers are designed to protect one AGM-65A/B/C/D/E/F/G all-up-round Maverick missile during worldwide shipment, storage, and handling. The containers will also be used for one missile without the guidance unit and for one missile without the guidance unit and the hydraulic actuation system. The CNU-445/E is the Air Force version of the container. The CNU-447/E is the Navy version and differs from the CNU-445/E only in some external Navy-specific handling features.

The test plan used for these containers was derived from ASD/TAML Specification Number CON 320 dated 22 Apr 86. An additional test, rain with wind, was added at the request of ASD/TAML. The tests were conducted in accordance with Federal Test Method Standard No. 101, Military Standard 810, Military Standard 648, Military Standard 1489, and ASD/TAML Specification Number CON 320.

Additional welds were incorporated into the CNU-447/E prototype because of cracked welds around the base of the CNU-445/E prototype. When subjected to rough handling tests there was no weld failure on the CNU-447/E. The additional welds should be added to the engineering drawings of both containers.

Results of the tests conducted on both prototype containers are acceptable. Both prototype containers will adequately protect the mentioned Maverick missile configurations during worldwide shipments in the public domain.

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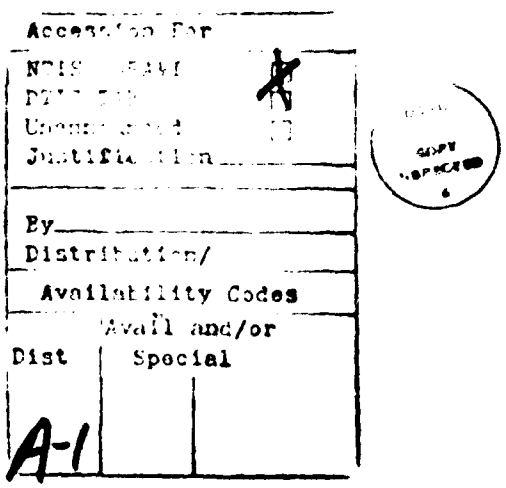

INTRODUCTION

BACKGROUND: Aeronautical Systems Division (ASD/TAML), Wright-Patterson AFB OH 45433-5000 requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to conduct certification and qualification testing on two new aluminum Maverick missile containers. The CNU-445/E and the CNU-447/E prototypes were designed and fabricated by AD/YNP, Eglin AFB FL 32542-5000.

PURPOSE: The purpose of this project was to determine if the CNU-445/E and the CNU-447/E container designs will protect the contents, the AGM-65A/B/C/D/E/F all-up-round (AUR) Maverick missile, during world-wide shipment, storage, and handling as set forth in ASD/TAML Specification Number CON 320 dated 22 Apr 86. The container will also be used for shipment, storage, and handling of a missile less the guidance unit (GU) and a missile less both the GU and the hydraulic actuation system (HAS).

TEST SPECIMEN

Two containers were sent from Eglin AFB for testing. The first container, the CNU-445/E prototype, is the Air Force version of the container and was subjected to most of the testing. The second container, the CNU-447/E prototype, is the Navy version of the container. The production versions differ only in external Navy-specific handling features. The corners of both containers were numbered counterclockwise from the aft end where the desiccant port and other accessories are located (see figure 1).

Design: The CNU-445/E and the CNU-447/E are controlled-breathing containers with a pressure relief valve, a humidity indicator, and a desiccant port. Each container is designed to limit the transmission of shocks to the missile to 30Gs when subjected to the conditions in ASD/TAML Specification CON 320. Fourteen wide-handle latches are designed to allow quick access to the container contents without the use of tools. The missile is attached to the cradle by a forward bracket and an aft strap (see figure 2). The bracket fits over the forward part of the missile and also pins into the missile itself. This bracket is attached to the cradle by two quick release pins. The strap fits between the two sets of fins on the aft end of the AGM-65 missile.

Construction: The container consists of aluminum extrusions for the exterior walls, the skids, and the missile cradle. Sheet aluminum is used for the top and bottom. Rubber pads between the missile and the cradle prevent scratching or scarring of the missile body. Four pound density polyethylene foam provides cushioning between the cradle and the floor and between the missile and the cover of the container (see figure 3). A silicone gasket provides a seal between the container base and the container cover.

The CNU-445/E prototype container differs from the proposed production container in the following aspects:

a. The upper wall on the container cover will be one extrusion instead of an extrusion with a piece of square tubing welded on top.

b. The forward clamp that holds the missile in place will be one extrusion instead of two extusions riveted together.

c. The position of the attachment of the grounding strap to the container body is different.

d. Additional welds are to be added to the interface between the lower wall and the skid.

The CNU-447/E container prototype tested incorporated all of these changes (see figures 4 and 5).

TEST OUTLINE AND TEST EQUIPMENT

Test Plan: Tests were conducted in accordance with AFPEA Test Plan 87-P-130 (see table 1). The tests used were selected to meet the qualification and certification requirements in ASD/TAML Specification CON 320. An additional test, the rain test, was added at the request of ASD/TAML. Test methods and procedures used were as outlined in Federal Test Method Standard No. 101 (FTMS No. 101), Military Standard 648 (MIL-STD-648), Military Standard 810 (MIL-STD-810), Military Standard 1489 (MIL-STD-1489), and ASD/TAML Specification CON 320 dated 22 Apr 86. Any modifications to the standard procedures are noted in the test plan or the results.

Test Containers: Tests 1-28 were performed on the CNU-445/E container, tests 29-37 were performed on the CNU-447/E.

Test Loads: Unless otherwise specified, all tests were conducted using the standard heavy test load weighing 670 pounds (see figure 2). Tests requiring the light missile used the light-weight missile test load weighing 330 pounds (see figure 6). The standard heavy test load became unusable during testing due to weights inside the missile breaking loose. A flight training missile weighing 660 pounds replaced the standard heavy test load where noted (see figure 7). A container base loaded to 1121 pounds, the weight of a container with a heavy load, was also used where noted to simulate a stacked container. For the UN drops only, a different heavy test load weighing 675 pounds was used.

Test Sites: Testing was conducted at: AFPEA, HQ AFLC/DSTZ, Building 70, Area C, Wright-Patterson AFB OH 45433-5999; at the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Building 65, Area B, Wright-Patterson AFB OH 45433; and at AD/YNP, Eglin AFB FL 32543-5000. Unless stated otherwise, the testing was conducted at AFPEA. The equipment required for each test is noted in the test plan.

TEST PROCEDURES AND RESULTS

1. Incoming Inspection (CNU-445/E)

Test Plan No. 1: The container, as received, was visually inspected. The exterior and interior surfaces, hardware, cushioning, and container seal were inspected. The container was also checked for weight compliance. Size compliance could not be determined since container drawings were not available. Markings could not be checked since the container was not painted.

Results: Lid weighed 157 pounds, base weighed 294 pounds, total weight of 451 pounds. The allowable total container weight was exceeded by 51 pounds (see recommendations). All required features were present.

2. Leak Test

Test Plan No. 2: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.016 psig. The results of this test are acceptable.

3. Rough Handling Tests (+140°F)

a. Test Plan No. 4a: The high temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

b. Test Plan No. 4b: The high temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 16Gs was obtained during the test.

c. Test Plan No. 4c: The high temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012 (see figure 8). The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 16Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of these tests are acceptable. See appendix 3 for acceleration results.

4. Rough Handling Tests (-40°F)

a. Test Plan No. 7a: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1 (see figure 9). The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 21Gs was obtained during the test.

b. Test Plan No. 7b: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

c. Test Plan No. 7c: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 28Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

5. Leak Test

Test Plan No. 5: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.018 psig. The results of this test are acceptable.

6. Vacuum Test

Test Plan No. 2: The vacuum retention test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.025 psig. The results of this test are acceptable.

7. Vibration Fatigue Test

Test Plan No. 11: The vibration fatigue test was conducted in accordance with MIL-STD-648, paragraph 5.3.2 (see figure 10). The container was rigidly attached to the platform. A sinusoidal vibration excitation was applied in a vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input from 5 to 12.5 Hz was at 0.125 inch double amplitude and input from 12.5 to 50.0 Hz was at 1.0G. A 15 minute dwell test was conducted at the resonant frequency. Then a 15 minute sweep was conducted from 5 to 50 Hz at 2 minutes per octave with input as noted above.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 8Gs was obtained at 11.5 Hz. The maximum transmissibility obtained was 4.7. The results of this test are acceptable.

8. Leak Test

Test Plan No. 12: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.007 psig. The results of this test are acceptable.

9. Rough Handling Tests ($-40^{\circ}F$), Light Missile

a. Test Plan No. 15a: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The test load was the light-weight missile. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 29Gs was obtained during the test.

b. Test Plan No. 15b: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The test load was the light-weight missile. The height of the drop was 20 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 24Gs was obtained during the test.

c. Test Plan No. 15c: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The test load was the light-weight missile. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no external damage to the container. A maximum of 20Gs was obtained during the test.

The container was opened after the pendulum-impact test. Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

10. Cover Handle Pull Test

Test Plan No. 27: The cover handle pull test was conducted in accordance with paragraph 4.2.2.1.17 of ASD/TAML Specification Number CON 320. One handle was used to lift the 157 pound cover off the ground. A 50 pound weight was placed in the cover to give a total weight of 207 pounds. The cover was maintained in that position for 5 minutes (see figure 11).

Results: Visual inspection revealed no deflection or permanent deformation to the cover handle or the container cover. The results of this test are acceptable.

11. Stand Off Test

Test Plan No. 30: The stand off test was conducted in accordance with paragraph 4.2.2.1.18 of ASD/TAML Specification Number CON 320. The cover was set on a concrete surface with the stand offs in contact with the floor. A load of 308 pounds was then placed on top of the cover. With the load removed, the cover was then slid on the stand offs five feet in each of four directions.

Results: Visual inspection revealed no deflection or deformation with the 308 pound load on top. No physical damage resulting in a loss of functional performance was found following the sliding. The results of this test are acceptable.

12. Hoisting Test (1 ring)

Test Plan No. 25c: The single ring hoisting test was conducted in accordance with MIL-STD-648, paragraph 5.8.5. The loaded container was lifted by each of the four lift rings separately and suspended for five minutes (see figure 12).

Results: Visual inspection revealed no damage to the container caused by this test. The results of this test are acceptable. While suspended, welds that secured the skids to the container floor were found to be cracked. The welds cracked during a previous test. The CNU-447/E container will be

subjected to rough handling tests to verify that a solution has been found (see tests 31a, b, and c).

13. Leak Test

Test Plan No. 26: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.007 psig. The results of this test are acceptable.

14. Vibration Fatigue Test, Light Missile

Test Plan No. 17: The vibration fatigue test was conducted in accordance with MIL-STD-648, paragraph 5.3.2. The container was loaded with the light-weight test missile and was rigidly attached to the platform. A sinusoidal vibration excitation was applied in a vertical direction and cyclically swept for 7.5 minutes at 2 minutes per octave to locate the resonant frequency. Input from 5 to 12.5 Hz was at 0.125 inch double amplitude and input from 12.5 to 50.0 Hz was at 1.0G. A 15 minute dwell test was conducted at the resonant frequency. Then a 15 minute sweep was conducted from 5 to 50 Hz at 2 minutes per octave with input as noted above.

Results: Visual inspection revealed no damage to the test load. The forward silicone pad on the container cradle was loose and came off when the missile was removed. The pad was put back on the container using RTV. No permanent damage or other problems were noticed with the container. The maximum acceleration obtained was 8Gs at the resonant frequency of 24 Hz. The maximum transmissibility obtained was 4.0. The results of this test are acceptable.

15. Low Temperature Test ($-65^{\circ}F$)

Test Plan No. 6: The low temperature test was conducted in accordance with MIL-STD-810, Method 502.2, Procedure 1. The loaded container was placed in an environmental chamber at $-65^{\circ}F$. After removal from the chamber, the container was allowed to reach ambient temperature before being visually examined for permanent deformation and structural failure.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

16. High Temperature Test (+165°F)

Test Plan No. 3: The high temperature test was conducted in accordance with MIL-STD-810, Method 501.2, Procedure 1. The loaded container was placed in an environmental chamber at +165°F. After removal from the chamber, the container was allowed to reach ambient temperature before being visually examined for permanent deformation and structural failure.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

17. Puncture Test

Test Plan No. 22: The pendulum puncture test was conducted in accordance with MIL-STD-1489, Method 505.1. The test apparatus used was a simulated forklift tine weighing 70 pounds suspended by wire cables. The tine was pulled straight back until it reached a height of 20 inches above its equilibrium height and released. The tine impact was made to each side and end of the unrestrained container at one-half inch above the forklift pocket (see figure 13).

Results: Visual inspection revealed small areas of permanent deformation, but no functional damage to the container. The results of this test are acceptable.

18. Structural Integrity Test

Test Plan No. 35: The structural integrity test was conducted in accordance with MIL-STD-648, paragraphs 5.5.2 and 5.5.3. The pressure relief valve was removed and the loaded container was sealed. The container was pressurized to 3.5 psig. The pressure was not maintained for any length of time and leakage was not monitored. The test was conducted to determine if permanent structural deformation, deformation that prevented removal of the contents, or any potentially unsafe conditions occurred. Similarly, the container was subjected to a vacuum of -2.5 psig and observed for the same failure criteria as above.

Results: Visual inspection revealed no damage or permanent deformation to the container. The results of this test are acceptable.

19. Leak Test

Test Plan No. 23: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.002 psig. The results of this test are acceptable.

20. Mechanical Handling Tests

a. Test Plan No. 24b: The forklift pushing test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.5.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

b. Test Plan No. 24c: The forklift towing test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.6.

Results: Visual inspection revealed no functional damage to the container. The results of this test are acceptable.

c. Test Plan No. 24a: The forklift handling test was conducted in accordance with FTMS No. 101, Method 5011.1, paragraph 6.2. 1x4 inch boards were used since the forklift used has hard rubber tires. The test was performed from the side and end forklift pockets. The test was also performed from the side forklift pocket on containers stacked two high and not banded. The stacked container was the loaded container base.

Results: During the test the container configuration was stable riding on the tines. Visual inspection revealed no damage to the container. The results of this test are acceptable.

21. Stacked Pendulum-Impact Test

Test Plan No. 9: The stacked pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The stacked container was the loaded container base. The test container and the loaded base were banded together. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 15Gs was obtained during the test. The results of this test are acceptable.

22. Tiedown Test

Test Plan No. 29: The tiedown strength test was conducted in accordance with MIL-STD-648, paragraphs 4.17.4 and 5.8.4. The test was conducted at the Flight Dynamics Laboratory.

Results: Visual inspection revealed no damage to the container or the test load. Procedures and results of the test are given in the AFWAL-TM-87-203-FIBT Report (see appendix 1).

The container was only subjected to a force of 1-1/2 times the gross weight in the aft direction instead of 3 times the gross weight. However, the container base is symmetrical and the force in the forward direction was 3 times the gross weight. The results of this test are acceptable.

23. Repetitive Shock Test (Superimposed Load)

Test Plan No. 13: The repetitive shock test was conducted in accordance with MIL-STD-648, paragraph 5.2.2.1 and FTMS No. 101, Method 5019.1. The stacked container was the loaded container base. The container and the loaded base were banded and placed on the platform. The containers were not attached to the platform, but restraining blocks were attached to the platform to prevent the containers from moving off the platform. The platform was vibrated at 3 to 5 Hz until the containers raised from the platform (1/16 inch feeler gauge clearance between bottom of the bottom container and the platform), or a maximum platform acceleration of 1.0G was achieved. The test was run at the determined frequency for a period of two hours.

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 6Gs at 4.3 Hz was obtained during the test. The maximum transmissibility obtained was 3.2. The results of this test are acceptable.

24. Leak Test

Test Plan No. 14: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.012 psig. The results of this test are acceptable.

25. Superimposed Load Test (+140°F)

Test Plan No. 21: The superimposed load test was conducted in accordance with FTMS No. 101, Method 5016.1. A load of 10,000 pounds was placed on top of the loaded base which was on top of the test container. The total load of 11,121 pounds remained on the test container for a period of one hour while placed in an environmental chamber at 140°F.

Results: Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

26. Hoisting Strength Test (4 Ring)

Test Plan No. 25d: The 4 ring hoisting strength test was conducted in accordance with MIL-STD-648, paragraph 5.8.3. The container was loaded with 10,000 additional pounds and hoisted by all four lift points simultaneously and left hanging for five minutes (see figure 14).

Results: Visual inspection revealed no damage to the container or the test load. The results of this test are acceptable.

27. Banded Flat Drop

Test Plan No. 19: The banded flat drop was conducted in accordance with MIL-STD-648, paragraph 5.2.8 except that the containers were strapped instead of banded together. The flight training missile was used as the test load. The stacked container was the loaded base. The drop height was 18 inches (see figure 15).

Results: Visual inspection revealed no damage to the container or the test load. A maximum of 20Gs was obtained during the test. The results of this test are acceptable.

28. Transportability Test

Test Plan No. 33: Performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

THE FOLLOWING TESTS WERE CONDUCTED ON THE CNU-447/E CONTAINER.

29. Incoming Inspection (CNU-447/E)

Test Plan No. 1: The container, as received, was visually inspected. The exterior and interior surfaces, hardware, cushioning, and container seal were inspected. The container was also checked for weight compliance. Size compliance could not be determined since drawings were not available for the container. Markings could not be checked since the container was not painted (see figure 4).

Results: Lid weighs 165.5 pounds, base weighs 276.5 pounds, total weight of 442 pounds. The allowable total container weight was exceeded by 42 pounds (see recommendations). All required features were present except the HLU-216 hoisting provisions.

30. Leak Test

Test Plan No. 2: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period there was no pressure loss. The results of this test are acceptable.

31. Rough Handling Tests (-40°F)

These tests were performed to verify the weld reinforcement added to the interface between the base and the skids. The acceleration of the test load was not monitored.

a. Test Plan No. 7a: The low temperature edgewise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5008.1. The height of the drop was 20 inches.

b. Test Plan No. 7b: The low temperature cornerwise-drop (rotational) test was conducted in accordance with FTMS No. 101, Method 5005.1. The height of the drop was 20 inches.

c. Test Plan No. 7c: The low temperature pendulum-impact test was conducted in accordance with FTMS No. 101, Method 5012. The impact velocity was 7 ft/sec, the height of the drop was 9 inches.

Results: Visual inspection revealed no damage to the container or the test load. The results of these tests are acceptable.

32. MK-45 Lifting Test

Test Plan No. 25b: The MK-45 lifting test was conducted in accordance with MIL-STD-648, paragraph 5.10. A total load of three times the gross weight of a single container was to be hoisted for five minutes. The opposite end of the container was supported on wooden blocks in order to simulate a second MK-45. The loaded base was placed on top of the loaded test container. An additional 1103 pounds placed on top of the loaded base for a total load of 3336 pounds (see figure 16).

Results: Cracks developed near the MK-45 lifting provisions as the container base was raised (see figure 17). The position of the MK-45 alignment hole was incorrect and caused the MK-45 to pull the lifting provision and the attached container wall from the rest of the container base. The results of this test are not acceptable. See test 36 for the retest.

33. Leak Test

Test Plan No. 26: The pneumatic pressure test was conducted in accordance with FTMS No. 101, Method 5009.2. The test was performed at 1.50 psig. The failure criteria for the test was 0.025 psig loss during a 30 minute period.

Results: At the end of the 30 minute test period the pressure loss was 0.010 psig. The results of this test are acceptable.

34. Conductive Path Test

Test Plan No. 28: The conductive path test was conducted in accordance with ASD/TAML Specification Number CON 320, paragraph 4.2.2.1.13.1. The DC resistance was measured between the missile skin and the container shell.

Results: The resistance was found to be 0.043 Ohm DC. The results of this test are acceptable.

35. Rain Test

Test Plan No. 32: The rain with wind source test was conducted in accordance with MIL-STD-810, Method 506.2, Procedure 1 except the container would not fit in the environmental chamber fully sideways. The container was subjected to a 4-inch/hour rain with 40 mph winds for one hour on each side and end (total of four hours). Figure 18 shows the extent that the container was rotated when tested sideways.

Results: Visual inspection showed no signs of water entry into the container. The results of this test are acceptable.

36. MK-45 Lifting Test

Test Plan No. 25b: Retest performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

37. HLU-216 Hoisting Test

Test Plan No. 25a: Performed at Eglin AFB.

Results: See appendix 2. The results of this test are acceptable.

38. UN Drop Tests

Test Plan No. 36: The UN drop testing was conducted as follows: The CNU-447/E prototype container was used for all five drops. A Maverick test load weighing 675 pounds was secured in the container. One flat drop from 1.2 meters (3.94 feet) was made to the bottom, top, left side, and forward end of the container (see figure 19). An additional drop was made to the right rear corner of the cover. Failure criteria was spillage of the contents.

Results: Visual inspection revealed no spillage of the contents. A detailed report of the results of this test can be found in AFPEA Report No. 88-R-06 titled "Performance Oriented Packaging Testing of the CNU-445/E and CNU-447/E Aluminum Maverick Missile Container." The results of this test are acceptable.

CONCLUSIONS

The container test plan was developed to insure the containers meet the requirements of ASD/TAML Specification CON 320.

The CNU-445/E prototype container provided the specified protection for the contents. However, this container will require several modifications to achieve final production configuration (see "Construction" on page 2).

The CNU-447/E prototype container tested met or exceeded all the requirements specified.

RECOMMENDATIONS

1. The CNU-447/E container should be used as a baseline to generate the engineering data.

2. The additional welds added to the CNU-447/E around the base should remain to provide the necessary structural integrity.

3. The changes made to the MK-45 handling features at Eglin AFB should be incorporated into the final design.

4. The maximum container weight in ASD/TAML Specification CON 320 should be changed to 450 pounds.

TABLE 1. CONTAINER TEST PLAN

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
1.	WEIGHT TEST *(4.2.2.1.14)	Container cover weight shall not be greater than 180 lbs. Total container weight should not be greater than 400 lbs.	Fully assembled container including shock vibration system and straps.	Scale
2.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure at 1.50 PSI and vacuum retention at -1.50 PSI. Test duration to be a minimum of 30 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.**	Test at ambient condition from compressed air supply/vacuum pump.	Water manometer
3.	HIGH TEMPERATURE TEST (+165°F) MIL-STD-810 Method 501.2 Procedure 1 (4.2.2.1.4)	Condition at +165°F for not less than 24 hours. There shall be no permanent deformation after container is taken to ambient temperature.	Test with heaviest all-up-round (AUR) missile load.	Visual inspection

COMMENTS: * Figures in parenthesis refer to paragraph in ASD\TAML Specification No. CON 320.
** In accordance with MIL-STD-648 (applies to all leak tests herein).

PREPARED BY: Larry Nugent
Larry Nugent, Mechanical Engineer

APPROVED BY:
RALPH ZYNDA, Chief, Design Br., AFPEA

AFALD FORM NOV 84

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

APPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
						18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
4.	ROUGH HANDLING TESTS (HIGH TEMPERATURE +140°F)			
a.	FED-STD-101 Method 5005.1 (4.2.2.1.6)	Cornerwise-drop (rotational) test. Condition at +140°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on diagonal bottom corners, total of two drops.* Test with heaviest AUR.	Tri-axial accelero-meters
b.	FED-STD-101 Method 5008.1 (4.2.2.1.6)	Edgewise-drop (rotational) test. Condition at +140°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on two adjacent bottom edges, total of two drops.** Test w/heaviest AUR	Tri-axial accelero-meters
c.	FED-STD-101 Method 5012 (4.2.2.1.6)	Pendulum-impact test. Condition at +165°F. Temperature of shock mitigation system at time of test shall be +140,+10,-0°F. Impact velocity 7 ft/sec***, drop height 9 inches. Peak resultant acceleration shall not exceed 30Gs.	One impact on each side and each end, total of four impacts. Test with heaviest AUR.	Tri-axial accelero-meters, Thermo-couples

COMMENTS: * Remaining corner drops to be performed in Test No. 7a.
** Remaining edge drops to be performed in Test No. 7b.
*** Impact velocity revised per ASD/TAML letter dated 24 Aug 87.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
5.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
6.	LOW TEMPERATURE TEST (-65°F) MIL-STD-810 Method 502.2 Procedure 1 (4.2.2.1.5)	Condition at -65°F for not less than 24 hours. There shall be no permanent deformation after container is taken to ambient temperature.	Test with heaviest AUR.	Visual inspection
7.	ROUGH HANDLING TESTS (LOW TEMPERATURE -40°F)			
a.	FED-STD-101 Method 5005.1 (4.2.2.1.7)	Cornerwise-drop (rotational) test. Condition at -40°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on diagonal bottom corners, total of two drops.* Test with heaviest AUR.	Tri-axial accelero-meters

COMMENTS: * These corners are opposite those impacted in Test No. 4a.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

APPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
b.	FED-STD-101 Method 5008.1 (4.2.2.1.7)	Edgewise-drop (rotational) test. Condition at -40°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on two adjacent bottom edges, total of two drops.** Test with heaviest AUR.	Tri-axial accelero-meters
c.	FED-STD-101 Method 5012 (4.2.2.1.7)	Pendulum-impact test. Condition at -65°F. Temperature of shock mitigation system at time of test shall be -40,+0,-10°F. Impact velocity 7 ft/sec***, drop height 9 inches. Peak resultant acceleration shall not exceed 30Gs.	One impact on each side and each end, total of four impacts. Test with heaviest AUR.	Tri-axial accelero-meters, Thermo-couples
8.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer

COMMENTS: ** These edges are opposite those impacted in Test No. 4a.
*** Impact velocity revised per ASD/TAML letter dated 24 Aug 87.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AFALD FORM NOV 84

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
						18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
9.	STACKED SHOCK TEST			
	FED-STD-101 Method 5012 (4.2.2.1.1)	Stacked pendulum-impact test. Banding of containers shall be through the forklift pockets and in the channels across the top of the container. Impact velocity 7 ft/sec*, drop height 9 inches. Peak resultant acceleration shall not exceed 30Gs.	Stacked two high and banded. One impact on each end and each side, total of four impacts. Test with heaviest AUR.	Tri-axial accelero-meters
10.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
11.	VIBRATION FATIGUE TEST			
	MIL-STD-648 Para 5.3.2 (4.2.2.1.2)	Input excitation of 0.125 inch double amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,+5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15	Rigidly attach container to exciter. The use of straps is prohibited. Test with heaviest AUR.	Tri-axial accelero-meters, Thermo-couples

COMMENTS: * Impact velocity revised per ASD/TAML letter dated 24 Aug 87.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
		minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency.		
12.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
13.	REPETITIVE SHOCK (SUPERIMPOSED LOAD) FED-STD-101 Method 5019.1 (4.2.2.1.3)	Test for not less than two hours at 3 to 5 Hz or 1G, whichever is less. Banding of containers shall be through the forklift pockets and in the channels across the top of the container. Transmissibility shall not exceed 5.	Stacked two high and banded, test bottom container. Test with heaviest AUR.	Tri-axial accelerometers

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION
14.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
15.	ROUGH HANDLING TESTS (LOW TEMPERATURE -40°F, LIGHT MISSILE)*			
a.	FED-STD-101 Method 5005.1 (4.2.2.1.7)	Cornerwise-drop (rotational) test. Condition at -40°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on diagonal bottom corners, total of two drops. Test with lightest AUR (w/o Guidance Unit (GU) and Actuating System (AS)).	Tri-axial accelerometer

COMMENTS: * Tests performed to identify maximum peak acceleration experienced by the lightest AUR missile.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

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AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
b.	FED-STD-101 Method 5008.1 (4.2.2.1.7)	Edgewise-drop (rotational) test. Condition at -40°F for not less than 24 hours. Drop height 20 inches. Peak resultant acceleration shall not exceed 30Gs.	Test performed in chamber. One drop on two adjacent bottom edges, total of two drops. Test with lightest AUR w/o GU and AS.	Tri-axial accelero-meter
c.	FED-STD-101 Method 5012 (4.2.2.1.7)	Pendulum-impact test. Condition at -65°F. Temperature of shock mitigation system at time of test shall be -40,+0,-10°F. Impact velocity 7 ft/sec*, drop height 9 inches. Peak resultant acceleration shall not exceed 30Gs.	One impact on each side and each end, total of four impacts. Test with lightest AUR w/o GU and AS.	Tri-axial accelero-meter, Thermo-couples
16.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer

COMMENTS: * Impact velocity revised per ASD/TAML letter dated 24 Aug 87.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
17.	VIBRATION FATIGUE TEST (LIGHT MISSILE)			
	MIL-STD-648 Para 5.3.2 (4.2.2.1.2)	Input excitation of 0.125 inch double amplitude or 1G, whichever is less. Sweep approximately logarithmically from 5 to 50 Hz over 5 minutes -0,+5 minutes (about 1/2 octave/min) for 15 minutes. Then dwell 15 minutes at the resonance frequency. The test may be interrupted to prevent excessive temperature rise in materials. Transmissibility shall not exceed 5 at the resonance frequency.	Rigidly attach container to exciter. The use of straps is prohibited. Test with lightest AUR w/o GU and AS.	Tri-axial accelero-meter, Thermo-couples
18.	LEAK TEST			
	FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less tnan 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AFALD FORM NOV 81, 4

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION
19.	FREE FALL DROP TEST (4.2.2.1.9)	Band two containers together. Flat drop from 18 inches. Peak resultant acceleration shall not exceed 30Gs.	Stacked two high and banded, test bottom container. Test with heaviest AUR.	Tri-axial accelerometers
20.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
21.	SUPERIMPOSED LOAD FED-STD-101 Method 5016.1 (4.2.2.1.8)	Condition container at +140°F prior to test. Stack two containers with additional load on top to simulate stacking 5 containers or 16 ft high, whichever is greater. Load equals load on bottom container times a factor of safety of 2. Additional load placed on top container such that the total load	Test conducted in chamber at +140°F. Stack two high, test bottom container. Test with heaviest AUR.	Visual inspection

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)					AFPEA PROJECT NUMBER 87-P-130	
CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE 18 Mar 88
ITEM NAME: AGM-65 Maverick Missile		MANUFACTURER				
CONTAINER NAME: CNU-445/E and CNU-447/E				CONTAINER COST		
PACK DESCRIPTION: Aluminum Container						
CONDITIONING: As noted below.						

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
		is carried by the stacking provisions. Test duration not less than 1 hour. There shall be no permanent deformation.		
22.	PUNCTURE RESISTANCE TEST MIL-STD-1489A Method 505 (4.2.2.1.20)	Impact will be made at a point 1/2 inch above the enclosed forklift pocket of the container base. There shall not be any damage affecting container performance.	One impact to each side and each end of the container base, total of four impacts. Test with heaviest AUR.	Visual inspection
23.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
24.	MECHANICAL HANDLING TESTS			
a.	FED-STD-101 Method 5011.1 Paragraph 6.2 (4.2.2.1.10)	Forklift handling test. Lift container(s) off ground with tines inclined 15 degrees and stack restrained to prevent sliding. Carry 100 ft in 23 seconds. Place two parallel 2x4s 54 inches apart in the path as follows: 30 ft from the start, square to the path; 60 ft from the start, at a 60° angle such that the left wheel strikes first; 90 ft from the start, at a 75° angle such that the right wheel strikes first. The container(s) shall remain stable on the tines during the test. There shall be no structural damage.	One container from one side and one end. Repeat with two stacked containers from the side only. Test with heaviest AUR.	Visual inspection
b.	FED-STD-101 Method 5011.1 Paragraph 6.5 (4.2.2.1.10)	Forklift pushing test. The tines should extend under but not support the container. Push on hard surface 35 ft in 85 seconds. There shall be no structural damage.	From one side and one end of container. Test with heaviest AUR.	Visual inspection

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
						18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
c.	FED-STD-101 Method 5011.1 Paragraph 6.6 (4.2.2.1.10)	Forklift towing test. Pull by towing rings 100 ft in 23 seconds. There shall be no structural damage.	From ends of container only. Test with heaviest AUR.	Visual inspection
25.	HOISTING STRENGTH TEST			
a.	MIL-STD-648 (4.2.2.1.11)	Hoisting beam test. Hoist container loaded to three times the gross weight with HLU 216/E weapon cradle hoist beam for five minutes. There shall be no damage or permanent deformation.	Test with heaviest AUR.	Visual inspection
b.	MIL-STD-648 Paragraph 5.10 (4.2.2.1.11)	MK-45 lifting test. Lift container loaded to three times the gross weight with the MK-45 hand lift truck for five minutes. There shall be no damage or permanent deformation.	Test with heaviest AUR.	Visual inspection
c.	MIL-STD-648 Paragraph 5.8.5 (4.2.2.1.11)	Single ring hoisting test. Hoist container at one lift point and leave hanging for five minutes. There shall be no damage or permanent deformation.	Test with heaviest AUR.	Visual inspection

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AFALD FORM NOV 84

AIR FORCE PACKAGING EVALUATION ACTIVITY (Container Test Plan)					APPEA PROJECT NUMBER 87-P-130	
CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE 18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
d.	MIL-STD-648 Paragraph 5.8.3 (4.2.2.1.11)	Four ring hoisting test. Hoist two banded containers loaded to ten times the gross weight of a single container by all lift points simultaneously and leave hanging for five minutes. There shall be no damage or permanent deformation.	Stacked two high and banded. Test with heaviest AUR.	Visual inspection
26.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
27.	COVER HANDLE PULL TEST (4.2.2.1.17)	Apply a force of 200 lbs on a cover handle in all directions that service loads are possible. There shall be no damage or permanent deformation.	Ambient	Scale

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

APPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
28.	CONDUCTIVE PATH TEST			
	(4.2.2.1.13.1)	Not greater than 0.10 Ohm DC resistance from each terminating and breaking point from the missile skin to an external ground.	Ambient	Ohmmeter
29.	TIEDOWN STRENGTH TEST			
	MIL-STD-648 Para 4.17.4 & 5.8.4 (4.2.2.1.11)	Tiedown attachments must be compatible with aircraft floors (cap 10,000 lbs with 20 inch centers). There shall be no damage to the container. Apply the following loads for one minute each:	Test with heaviest AUR.	Load cells, Visual inspection
	MIL-A-8421 Para 3.3.4	* Forward 3 x gross wt. * Aft 3 x gross wt. * Lateral 1-1/2 x gross wt. ** Down 4-1/2 x gross wt. ** Up 2 x gross wt.		

COMMENTS: * Using two tiedown rings.
** Using all four tiedown rings.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AFALD FORM NOV 84

AIR FORCE PACKAGING EVALUATION ACTIVITY

(Container Test Plan)

AFPEA PROJECT NUMBER					
87-P-130					
CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE: 18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
30.	STAND-OFF TEST (4.2.2.1.18)	Place load two times the cover weight on cover. The cover shall not deform or deflect. With load removed, slide cover on the stand-offs five feet in each of four different directions. There shall be no damage to the sealing surface.	Place container cover on a concrete floor resting on the stand-offs.	Visual inspection
31.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
32.	RAIN WITH WIND TEST*** MIL-STD-810 Method 506.2 Procedure 1	Rain at four inches per hour, wind velocity 40 miles per hour. Test duration four hours. There shall be no water intrusion.	One hour with each side and end facing into the wind, total of four hours. Test with heaviest AUR.	Visual inspection

COMMENTS: *** Added at the request of ASD/TAML.

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

APPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR: 108x28.5x30	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE: 18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRUMENTATION
33.	TRANSPORTABILITY TEST (4.2.2.1.21)	Free fall flat drop test from a drop height of 48 inches. Impact shall be made on a concrete surface. The container shall not spill its contents.	One drop on the most vulnerable surface or corner. Test with heaviest AUR.	Visual inspection
34.	LEAK TEST FED-STD-101 Method 5009.2 (4.2.2.1.12)	Pneumatic pressure with 1.50 PSI. Test duration not less than 15 minutes. Leakage rate shall not exceed 0.05 PSI/HR after temperature stabilization.	Ambient	Water manometer
35.	STRUCTURAL INTEGRITY TEST MIL-STD-648 Paragraphs 5.5.2 & 5.5.3 (4.2.2.1.16)	Pressurize container to 3.5 PSI momentarily and return to ambient. Apply a vacuum of -2.5 PSI momentarily and return to ambient. Any failure resutling in or causing an unsafe condition shall be cause for rejection. Permanent deformation of the container structure sufficient to prevent	Ambient	Water manometer

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

AIR FORCE PACKAGING EVALUATION ACTIVITY
(Container Test Plan)

AFPEA PROJECT NUMBER: 87-P-130

CONTAINER SIZE (L x W x D)(INCHES) INTERIOR:	EXTERIOR:	WEIGHT (LBS) GROSS:	ITEM:	CUBE (CU. FT.)	QUANTITY	DATE
	108x28.5x30					18 Mar 88

ITEM NAME: AGM-65 Maverick Missile

MANUFACTURER:

CONTAINER NAME: CNU-445/E and CNU-447/E

CONTAINER COST:

PACK DESCRIPTION: Aluminum Container

CONDITIONING: As noted below.

TEST NO.	REF STD/SPEC AND TEST METHOD OR PROCEDURE NO'S	TEST TITLE AND PARAMETERS	CONTAINER ORIENTATION	INSTRU-MENTATION
		the safe removal of the missile shall also be cause for rejection.		
36.	UN DROP TEST UN "Orange Book", Requirement 9.7.3	Drop container from a height of 1.2 meters (3.94 feet), as required for Packing Group II. The container shall not spill its contents. A different container may be used for each drop.	One each flat drop on the bottom, top, long side, and short side, and a corner drop. Total of 5 drops. Test with heaviest AUR	Visual inspection
37.	SEAL INTEGRITY (4.2.2.1) (4.2.3)	Failure to pass a leak test shall constitute failure of all tests performed after the last successful leak test regardless of the results or rejection criteria of the tests.		

COMMENTS:

PREPARED BY: Larry Nugent, Mechanical Engineer

APPROVED BY: RALPH ZYNDA, Chief, Design Br., AFPEA

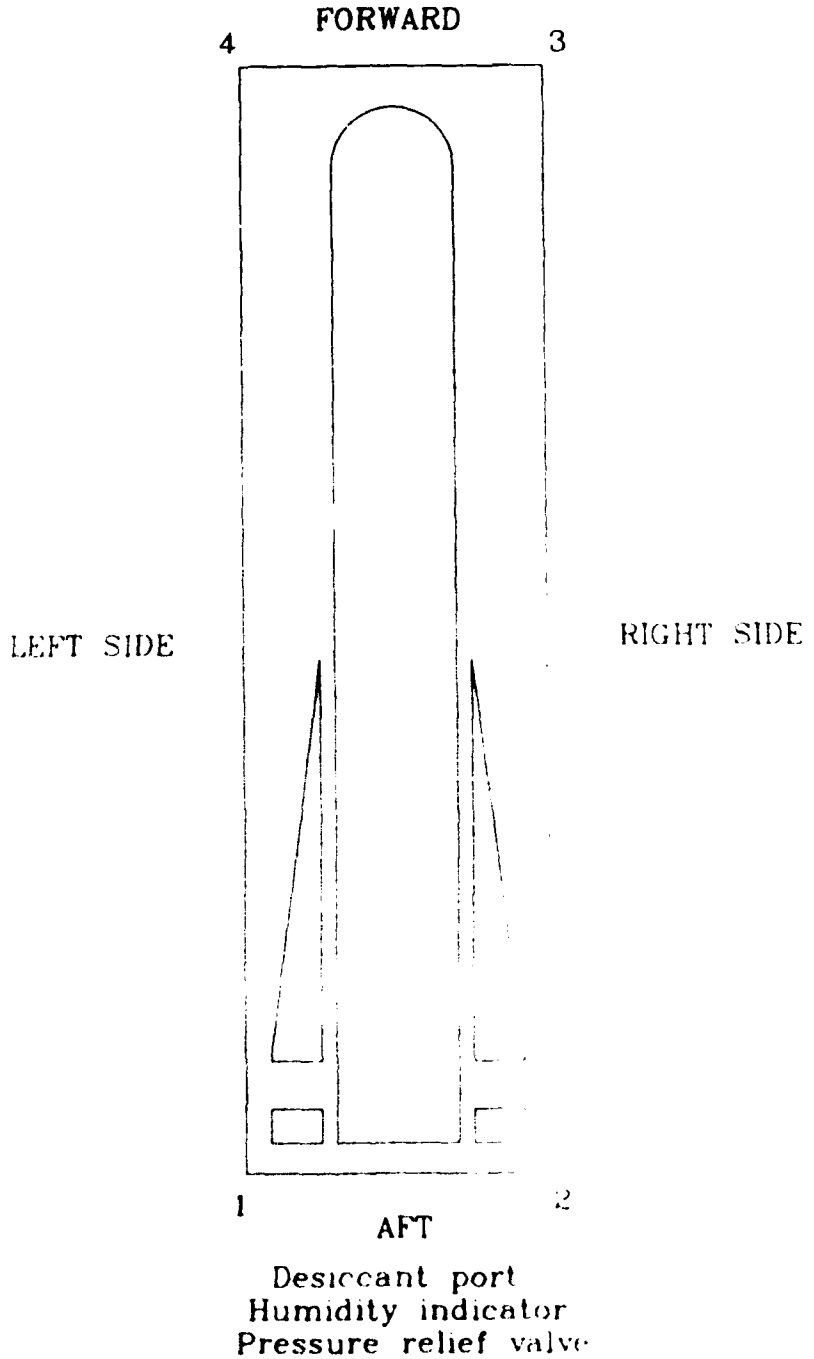


Figure 1. CNU-445/E and CNU-447/E corner numbering.

Figure 2

CNU-445/E prototype with heavy test load.

Figure 3

Cover of CNU-445/E.

Figure 4

CNU-447/E prototype.

Figure 5

CNU-447/E forward clamp.

Figure 6

Light missile test load.

Figure 7

Flight trainer test load.

Figure 8

High temperature pendulum-impact test.

Figure 9

Low temperature edge drop test.

Figure 10

Set-up for vibration fatigue test (prior to securing to table).

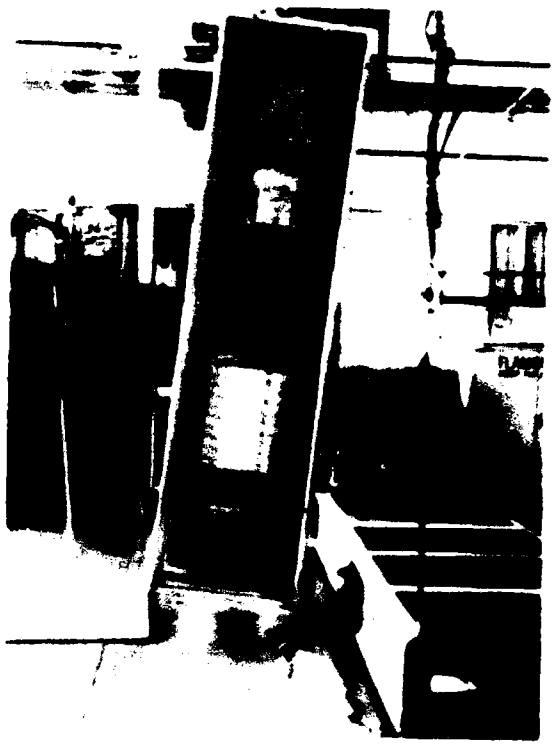


Figure 11

Cover handle pull test.

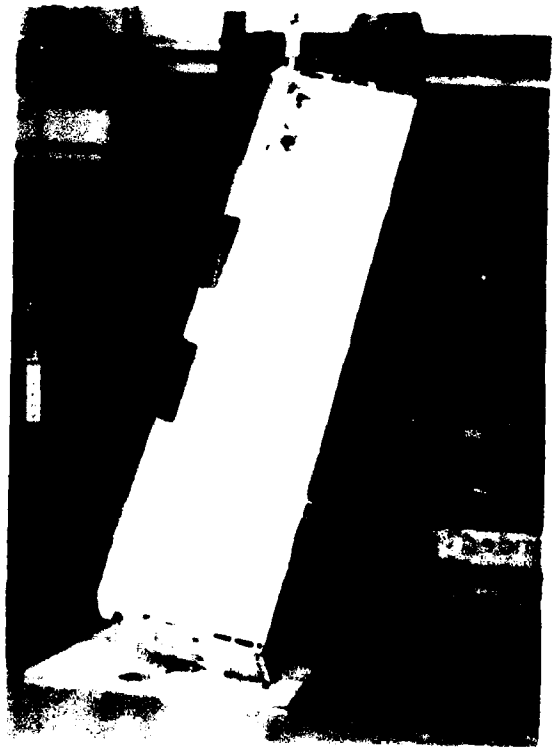


Figure 12

Single ring hoisting test.

Figure 13

Puncture resistance test.

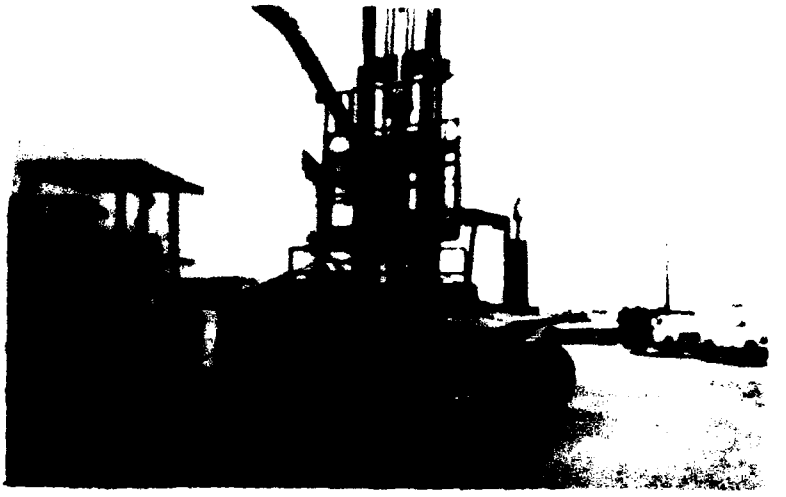


Figure 14

Four ring hoisting test.

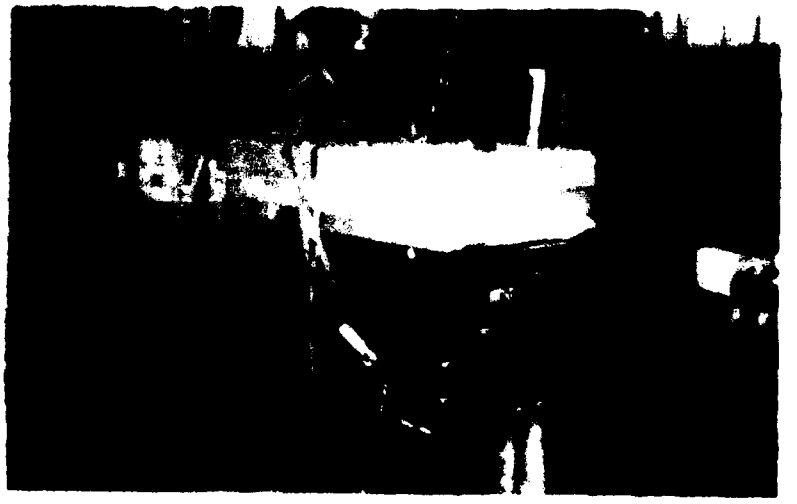


Figure 15

Banded flat drop test.

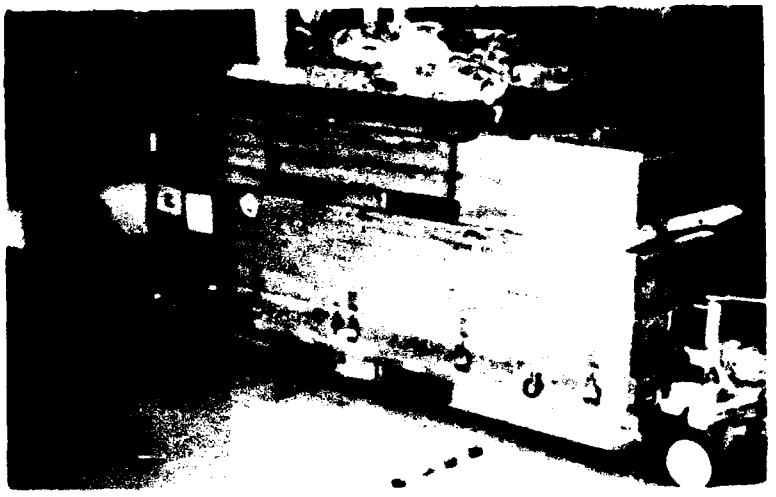


Figure 16

MK-45 lifting test.

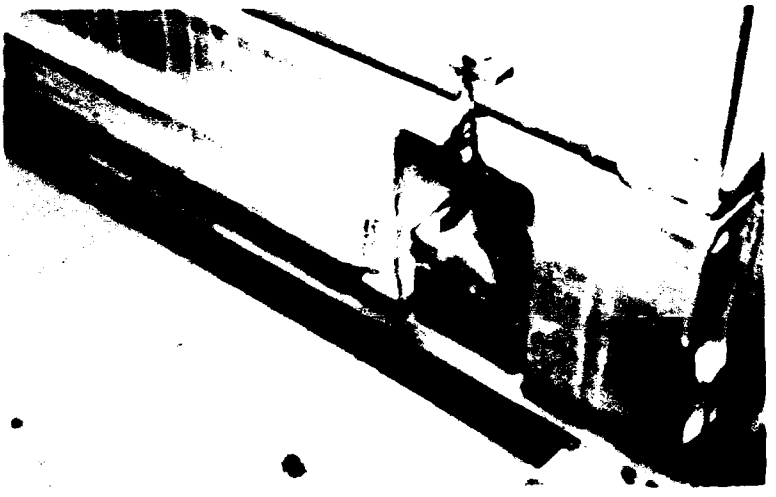


Figure 17

MK-45 lifting provision damage.

Figure 18

Container angle in rain chamber.

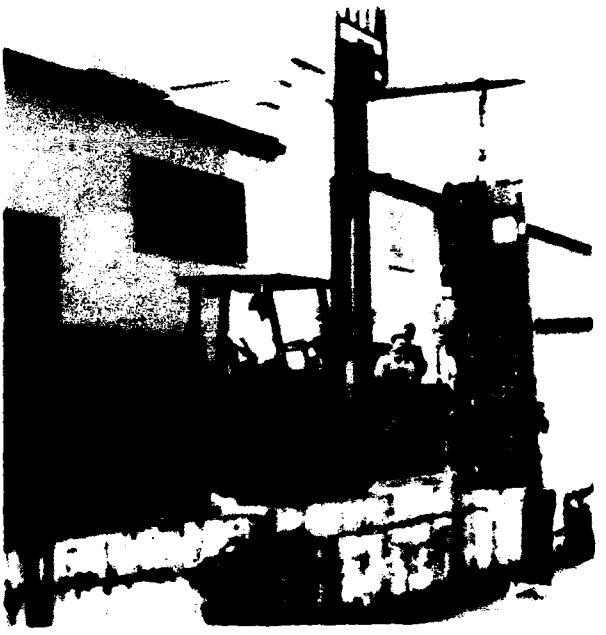
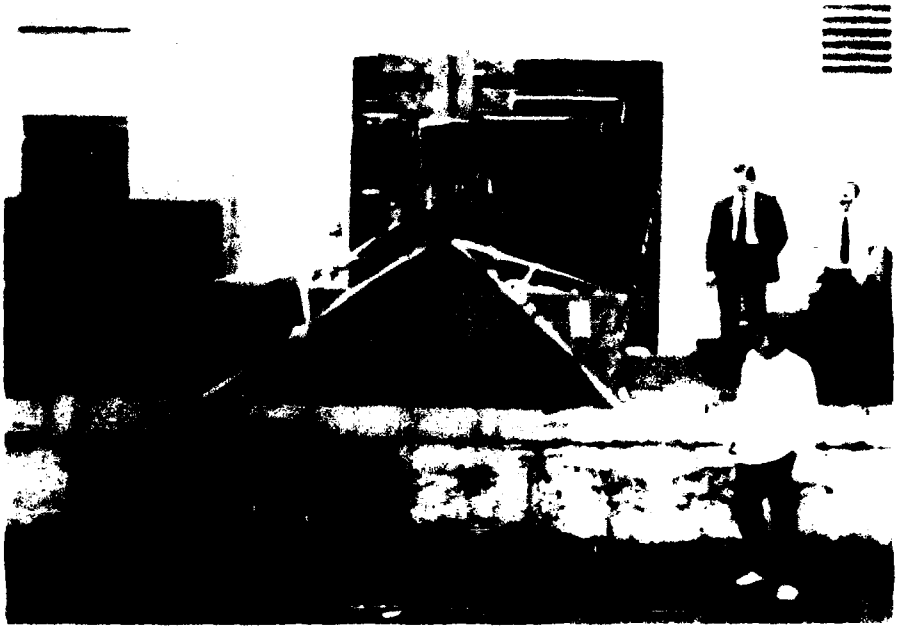


Figure 19

UN drop test set-up.

Figure 20

UN drop test set-up.



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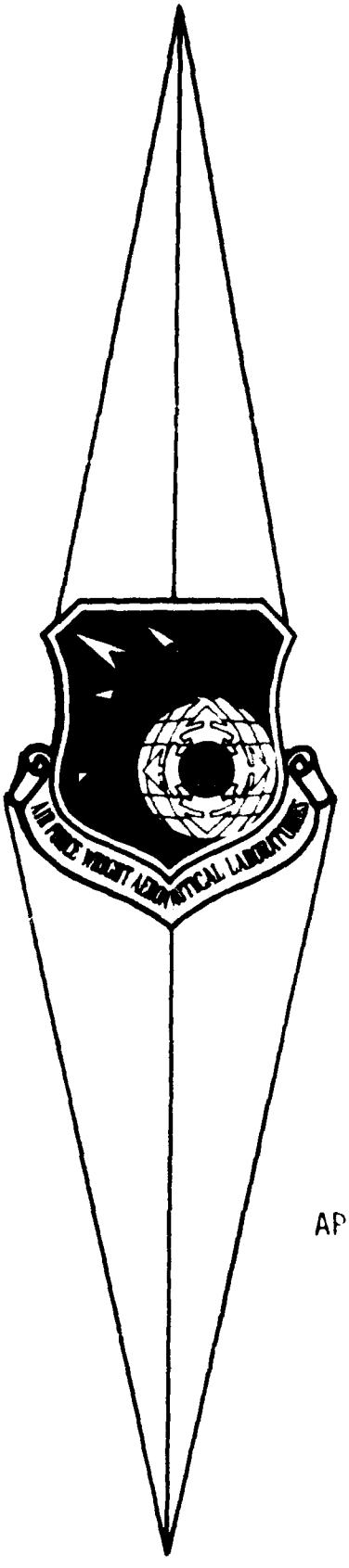

AFWAL-TM -87-203-FIBT

MAVERICK MISSILE CONTAINER TIE-DOWN STRENGTH TEST

2 LT DAVID J. KRIEP
MR. FRED HUSSONG

STRUCTURES TEST BRANCH
STRUCTURES DIVISION

NOVEMBER 1987

FLIGHT DYNAMICS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

APPENDIX 1

FOREWORD

This report was prepared by the Structures Test Branch, Structures Division, Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio. It is a formal record of the testing conducted on two Maverick Missile Containers. One was tested for the Air Force Packaging Evaluation Agency, and the other was tested for the Maverick Missile Systems Program Office.

The test program at the Structures Test Branch was directed by 2 Lt. David J. Krier as Project Engineer and Mr. Fred Bussong as Instrumentation Engineer. Technical assistance was provided by Miss Suzanne Westfall, Mr. Rick Farmer, and Mr. Mark Pennywitt.

This report has been reviewed and is approved for publication.

SANFORD LUSTIG
Chief, Structures Test Branch
Structures Division

ABSTRACT

This report describes the structural tests performed on two Maverick Missile Containers. The objective of the test was to verify the structural integrity of the tie-down provisions on each container. The tests proved that these provisions were adequate.

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III.	TEST PROCEDURE	2
IV.	TEST RESULTS AND PROCEDURES	2
V.	FIGURE 1 - TEST SET-UP	3
	FIGURE 2 - LOADING DIAGRAM	4
	FIGURE 3 - LOAD REPORT	5

I. INTRODUCTION

The Air Force Packaging Evaluation Agency requested that a tie-down strength test be performed on two Maverick Missile containers. One of the containers was their own, while the other was from the Maverick Missile Systems Program Office. The containers were of different designs, one being made of metal, the other of fiberglass. The tie-down locations were nearly identical on the two containers, so only one test fixture was necessary to test both of them.

In accordance with MIL-A-8421F, in the absence of clearly defined tie-down procedures, the loads were applied at an angle 45o downward from the horizontal and simultaneously 45o outward from the container surface. The testing was conducted at the Structures Test Branch on 1 October 1987.

II. TEST SET-UP

A. MECHANICAL

Figure 1, Test Set-Up, shows the test fixture that was built to apply the loads. Four Parker-Hannifin 2-inch hydraulic cylinders, one at each of the four tie-down rings, were connected in parallel to a single control channel of an Edison Hydraulic Load Maintainer.

Figure 2, Loading Diagram, shows the maximum applied load and the components of that load in the lateral, forward, and down directions. This figure also shows the distances between the

tie-down ring and the base attachment of the hydraulic cylinder.

B. INSTRUMENTATION

The instrumentation consisted of four load cells, one in line with each hydraulic cylinder. Each load cell had a capacity of 5000 pounds.

III. TEST PROCEDURE

The load was increased from 0 pounds to 3374* pounds in each cylinder in 10 percent increments (of maximum load). At each increment, the load was held for one minute. After the 100 percent condition had been applied for one minute, the load was released.

* See Figure 3, Load Report. 3374 pounds is the average of the four applied loads.

IV. TEST RESULTS AND CONCLUSIONS

No failure of the tie-down rings occurred on either container. No cracking or physical damage was noted during or after the tests.

MIL-A-8421F requires that loads applied to the tie-down rings be based on the gross weight of the container and missile, and the number of g's the container experiences in certain directions. Figure 3, Load Report, shows that each of the components of applied load met or exceeded those required by MIL-A-8421F. The gross weight used for the test was 1121 pounds.

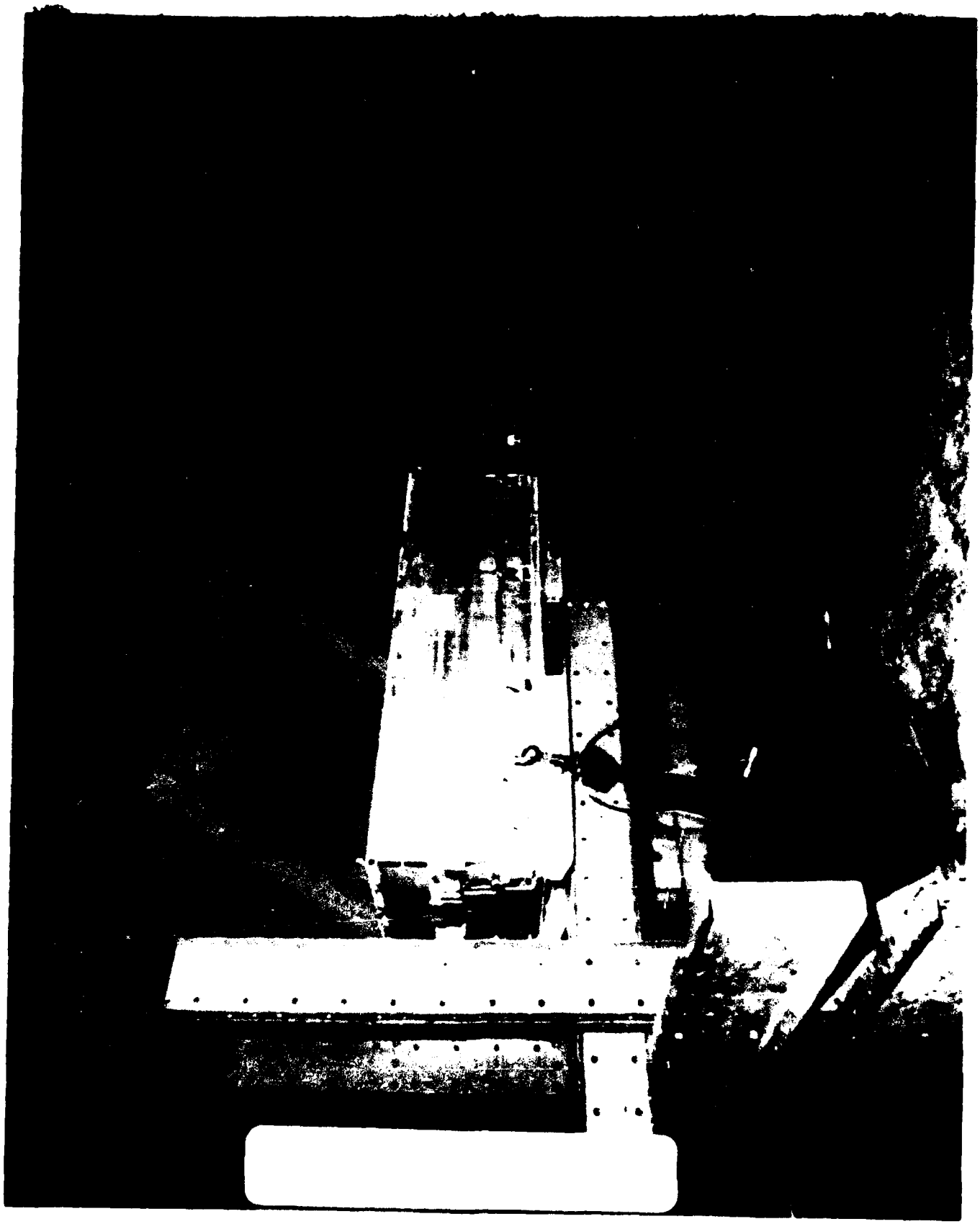
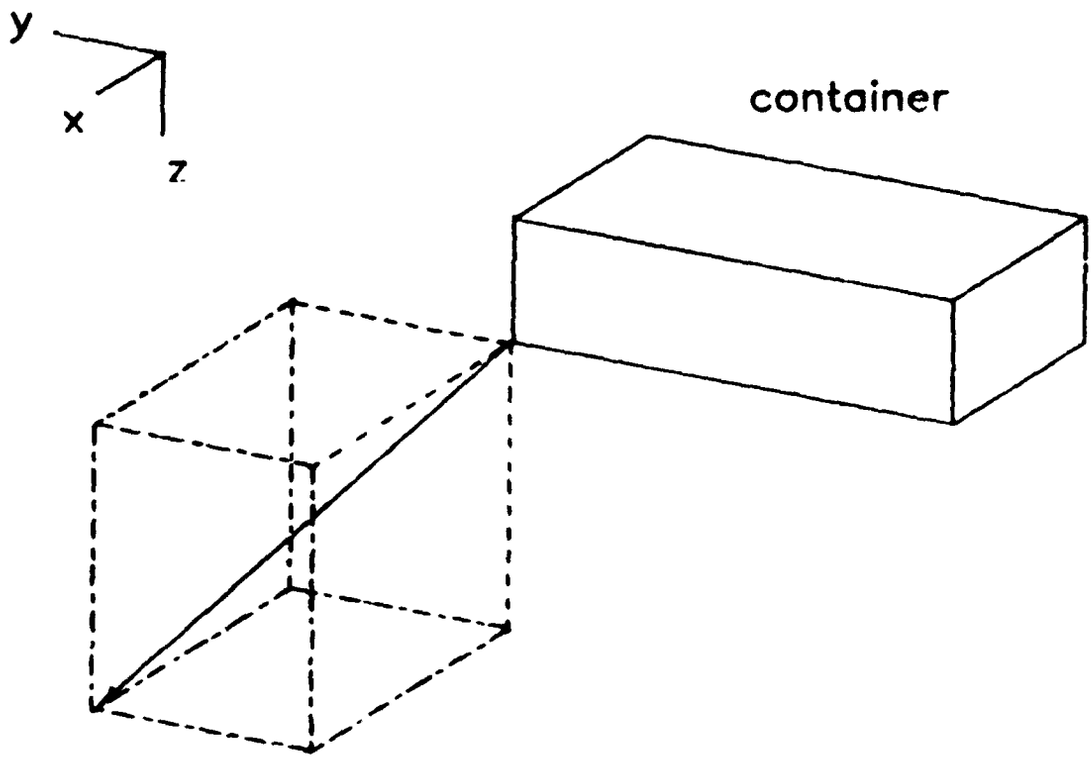


FIGURE 2
LOADING DIAGRAM



COMPONENTS OF APPLIED LOAD (RED) --------

Fx = 1681 lb

Fy = 1681 lb

Fz = 2378 lb

APPLIED LOAD (PURPLE) ———

Fr = 3363 lb

DISTANCES OF PULL POINTS (BLUE)—·—·—·—

dx = 32 in

dy = 32 in

dz = 46 in

FIGURE 3

LOAD REPORT

The loads in each of the four cylinders were individually measured. The cylinders were connected to one control channel, so the loads applied in each cylinder were nearly equal. For clarity, the applied loads shown below are the average of the four applied loads.

	FWD	AFT	LAT	UP
MIL-A-8421F Requirements (Loads applied to container)	3 g's 3363 lb.	1.5 1681	1.5 1681	2 2242
MIL-A-8421F Requirements (Loads applied per tie-down)	1681 lb.	840	840	561
Applied load per tie-down	1687 lb.	844	844	563

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARMAMENT DIVISION (AFSC)
EGLIN AIR FORCE BASE FLORIDA 32542-5000

REPLY TO
ATTN OF: YNP

SUBJECT: CNU-447/E Test Report

AFPEA/DSTZT

1. The following tests were sucessfully completed on the CNU-447/E container at Eglin AFB. The data submitted below is to be incorporated into your final test report of the CNU-445/E and CNU-447/E.

a. 46" Certification Drop. This test was successfully completed on 4 December 1987 with no major damage noted. The container did not spill the contents. (see photo 1)

b. MK-45 Hand Lift Truck Test. This test was successfully completed on 4 Feburary 1988 with the following results:

(1) Test: Lift Test (static). A superimposed load of 2250 pounds was placed on the fully loaded container. A MK-45 hand truck was used to lift the total load off the floor and allowed to stand for 5 minutes. (see photo 2)

Results: There was no deformation to the fittings or container. The results were acceptable.

(2) Test: Impact Test. The fully loaded container was placed on a one inch steel plate. A MK-45 hand truck was used to raise the container 3 inches off the plate. The container was rolled off of and onto the steel plate 4 times. (see photo 3)

Results: There was no deformation to the container. The results were acceptable.

Note: This test was not required by the test plan. However, this test is specified in MIL-STD-648A.

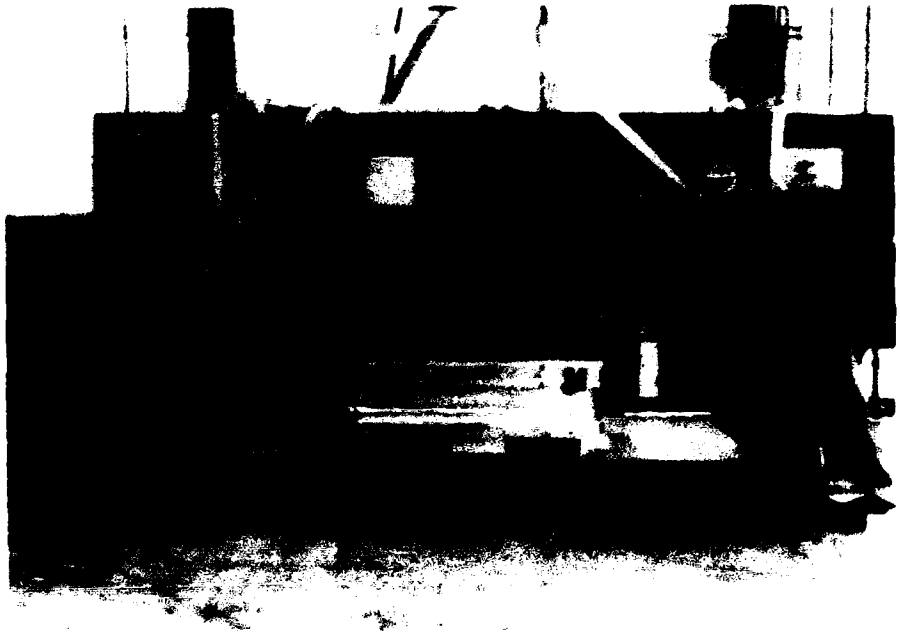
c. HLU-216 Sling Lift Test. On 2 Feburary 1988 a dummy loaded CNU-445/E container was secured to the base of the fully loaded CNU-447/E container. A lifting bar, made in-house, was secured to the HLU-216 lift points and the two containers (gross weight 3520 lbs) were lifted off the floor and allowed to hang for 5 minutes. (see photo 4)

Results: The test results were acceptacle. There was no deformation of the fittings or the container.

2. Please contact Guy Clark (AUTOVON 872-3779) if you require additional information.

WALTON A. ORR, PhD
Director Pkg & Transp
Dep for Armament Equipment

4 Atch
1. 48" Certification Drop Photo
2. Lift Test Photo
3. Impact Test Photo
4. HLU-216 Sling Lift Test Photo



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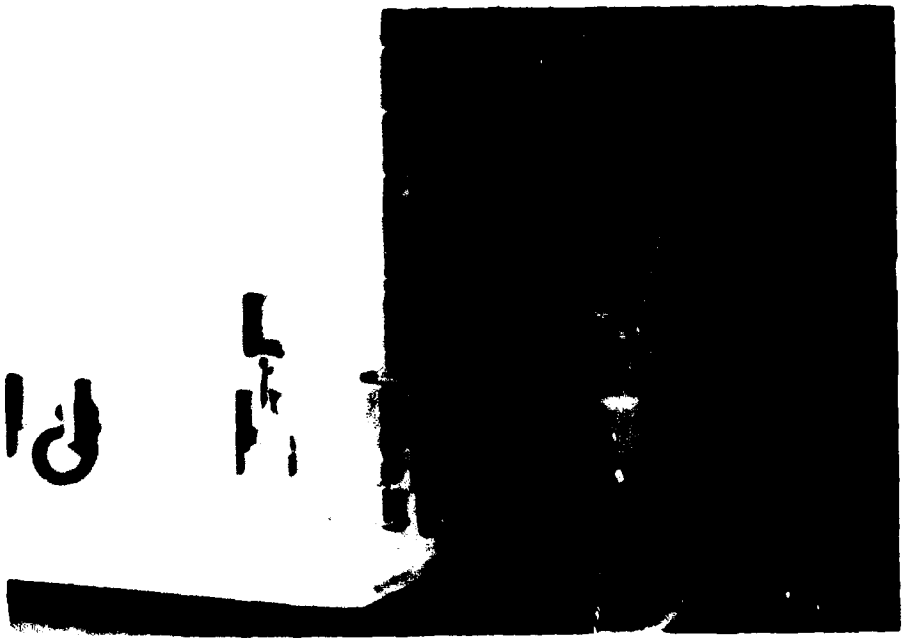
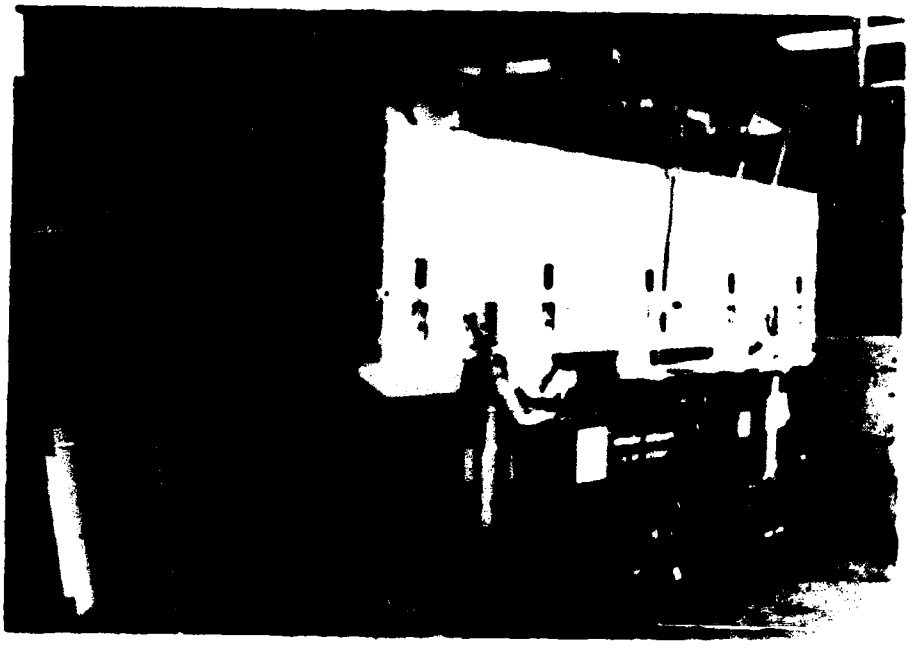


Attachment 2

Attachment 3



Attachment 4

CNU-445/E CONTAINER - DETAILED ACCELERATION RESULTS

HIGH TEMPERATURE ROUGH HANDLING TESTS (+140°F)

Impact	Position	Accelerometer readings (Gs) Fore	CG	Aft
20" rotational drop	Corner 4	----	10.4	16.0
20" rotational drop	Edge 3-4	28.4	15.8	13.3
20" rotational drop	Corner 2	5.5	10.0	14.4
20" rotational drop	Edge 1-4	6.6	8.9	11.7
7 ft/sec pendulum-impact	Edge 2-3	8.2	8.7	9.8
7 ft/sec pendulum-impact	Edge 1-2	13.7	15.8	10.1

1. CG accelerometer loose when the container was opened.
2. The missile rotated to the right slightly.
3. Putty placed on the missile fins prior to the test showed that there were small clearances between the missile and the container, but there was no contact.

LOW TEMPERATURE ROUGH HANDLING TESTS (-40°F)

Impact	Position	Accelerometer readings (Gs) Fore	CG	Aft
20" rotational drop	Corner 3	----	13.6	20.3
20" rotational drop	Corner 3	----	12.6	16.1
20" rotational drop	Corner 1	11.3	18.1	28.1
20" rotational drop	Edge 1-2	8.6	21.3	----
20" rotational drop	Edge 2-3	15.6	15.6	18.7
7 ft/sec pendulum-impact	Edge 3-4	28.1	17.6	22.6
7 ft/sec pendulum-impact	Edge 1-4	13.7	14.4	12.9

1. No damage to the container or the missile test load.

VIBRATION FATIGUE TEST

Natural frequency 11.5 Hz
(input: 0.85G peak, 0.125 inch double amplitude)

	Fore	CG	Aft
Maximum Acceleration (Gs, peak to peak)	8.0	5.7	7.6
Maximum Transmissibility	4.7	3.4	4.5

1. No damage to the container or the missile test load.

LOW TEMPERATURE ROUGH HANDLING TEST (-40°F), LIGHT MISSILE

Impact	Orientation	CG Accelerometer (Gs)
20" rotational drop	Corner 1	24.2
20" rotational drop	Edge 1-2	28.8
20" rotational drop	Corner 3	15.8
20" rotational drop	Edge 1-4	----
20" rotational drop	Edge 1-4	21.9
7 ft/sec pendulum-impact	Edge 2-3	13.8
7 ft/sec pendulum-impact	Edge 3-4	11.6
7 ft/sec pendulum-impact	Edge 1-4	16.6
7 ft/sec pendulum-impact	Edge 1-2	19.7

1. No damage to the container or the missile test load.

VIBRATION FATIGUE, LIGHT MISSILE

Natural frequency 24 Hz
(input: 1.0G peak)

	CG
Maximum Acceleration (Gs, peak to peak)	7.8
Maximum Transmissibility	3.9

1. Forward silicone pad between missile and cradle off.

STACKED PENDULUM IMPACT, BANDED

Impact	Orientation	CG Accelerometer (Gs)
7 ft/sec pendulum-impact	Edge 1-4	9.8
7 ft/sec pendulum-impact	Edge 2-3	12.5
7 ft/sec pendulum-impact	Edge 3-4	9.3
7 ft/sec pendulum-impact	Edge 1-2	14.6

1. No damage to the container or the missile test load.

REPETITIVE SHOCK, BANDED

Input 4.3 Hz, 1.0 inch double amplitude, 0.95G peak

	CG
Maximum Acceleration (Gs, peak to peak)	6.0
Maximum Transmissibility	3.2

1. No damage to container or the missile test load.

BANDED FLAT DROP

Trainer missile, strapped instead of banded

	Acceleration at CG (Gs)
18" flat drop	19.7

1. No damage to the container or the missile test load.